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(54) Title of InventionCircumferential Welding Method of Clad Steel Pipe

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Specification

1. TITLE OF THE INVENTION
Circumferential Welding Method of Clad Steel Pipe

2. Scope of Patent Claims

What is claimed:

Claim 1

A clad steel pipe circumferential welding method comprising friction welding or dispersion bonding or flashbutt welding solid short pipes having the identical composition as cladding material of clad steel pipes to ends of said clad steel pipes, and then identical material welding between said solid short pipes.

3. DETAILED DESCRIPTION OF THE INVENTION

PURPOSE OF THE INVENTION

This invention relates to a circumferential welding method, and attempts to provide a method for obtaining circumferential welded clad metal pipe with excellent corrosion resistance, and to obtain a good seam even when there is a misalignment in the groove.

INDUSTRIAL FIELD OF THE APPLICATION

Clad steel pipe and welding technology.

PRIOR ART

The method for circumferential welding of clad steel pipe is normally to press stainless steel clad steel pipes 10, 10 together and then manually welding or TIG welding as shown in Fig. 4, and a chamfer 11, 11 is formed as shown in Fig. 5 and then this is laminate welded 12 to form a bridge from the first layer to multiple layers from the stainless steel cladding material 10a to the carbon steel base material 10b.

PROBLEMS TO BE RESOLVED BY THE INVENTION

However, the result of the conventional method described above is that restricting the welded metal of the first layer to the range of the thickness of the stainless steel cladding material 10a is difficult, and the formation of bridges between the cladding material 10a and the carbon steel base material 10b occurs easily, and in these cases, the quantity of alloy elements such as Cr, Ni, or Mo or the like in the stainless steel cladding material 10a is reduced by dilution from the carbon steel 10b side, and corrosion resistance is reduced in these regions. Furthermore, if the circularities of the steel pipes to be welded differ slightly, problems will arise in the pressed together chamfer region as shown in Fig. 6. In other words, the stainless steel cladding material 10a of normal clad steel pipe has a thickness of only 2 ~ 3 mm, so when alignment problems occur as shown in Fig. 6, the cladding thickness in the circumferential weld seam region will be extremely small, and therefore a drop in corrosion resistance is inevitable.

CONSTITUTION OF THE INVENTION

MEANS TO RESOLVE PROBLEMS

This invention was conceived after repeated investigations of the actual situations described

above, and is a clad steel pipe circumferential welding method comprising friction welding or dispersion bonding or flashbutt welding solid short pipes having the identical composition as cladding material of clad steel pipes to ends of said clad steel pipes, and then identical material welding between said solid short pipes.

FUNCTION

Joining of different types of metal by solid phase welding is positively achieved by joining such as by friction welding solid short pipes having the same composition as the cladding material for the clad steel pipe, thus eliminating the dilution of the weld metal by the base material composition of the clad steel pipe because single material welding is performed between these solid short pipes, and circumferential welding can effectively be performed in a manner which sufficiently ensures the properties of said clad steel pipe cladding material.

PREFERRED EMBODIMENT

In describing specific preferred embodiments of the present invention while appropriately referring to the attached drawings, when pressing together and welding the same clad steel pipe 10 as shown in Fig. 2 and Fig. 3 with cladding material 10a on the inner surface side as shown in Fig. 1, a solid short pipe 1 having the same composition as cladding material 10a is joined by a friction weld 2 as shown in Fig. 1 (A), and then as shown in Fig. 1 (B), a chamfer 3 is made in the tube end region of the solid short pipe 1.

Clad steel pipe 10, 10 which has been prepared in this manner is pressed together as shown in Fig. 1 (C), and is circumferentially welded 2 in this condition at the location shown in Fig. 1 (D) using a welding material 4 similar to the short pipe 1.

The reason a friction weld method is used for joining the solid stainless steel short pipe 1 to the stainless steel cladded steel pipe 10 as shown in Fig. 1 (A) is that friction welding is said to be the most appropriate method because it allows solid phase joining, and there are no remaining problems with joining different materials such as the short pipe 1 to a carbon steel base material 10b such as the clad steel pipe 10. Friction welding uses a short pipe with a length of 100 ~ 200 mm as the stainless steel solid short pipe 1, and as shown in Fig. 2, a long clad steel pipe 10 is fixed in place while a short pipe 1 is rotated as a rotating body while pressure is applied in order to achieve a suitable joint by means of a simple rotating operation. However, in certain circumstances, dispersion bonding or flashbutt welding may be used instead of friction welding.

In this manner, if solid short pipe 1 is welded on, a chamfer 3 is formed between the solid short pipes 1, 1, and butt welding is performed using a weld metal 4 which is the same material as the solid short pipe 1, the carbon steel base material 10b will not be diluted into the weld metal 4 and there will be almost no change in the composition of the solid short pipe 1, even if there is a misalignment as shown in the previously mentioned Fig. 6 no matter the range of the weld metal of the first layer, so there will be absolutely no degradation in corrosion resistance or other properties, and therefore it will be possible to achieve a good weld for clad steel pipe.

Specific weld examples using the method of this invention will be described below.

The chemical analysis results of a base material and a cladding material in a 2 phase stainless steel clad steel pipe used as the test specimen steel pipe were as shown in Table 1, and the size of the steel pipe was 30 in. OD x 17.1 mm.

Table 1

	C	Si	Mn	P	S	Nb	Ni	Cr	Ho	Al	N
Cladding material (2 phase steel)	0.017	0.48	1.00	0.016	0.001	--	5.48	23.37	2.96	0.042	0.139
Base material (x 6.5)	0.028	0.25	1.52	0.0044	0.001	0.039	0.14	--	--	0.030	0.0048

Furthermore, a two-phase solid steel pipe with a material thickness of 17.1 mm and the same composition as the cladding material shown in Table 1 was prepared as the short pipe 1, and this was welded on by a friction weld. In other words, the conditions for the friction weld are as shown in the following Table 2.

Table 2

Test Sample Dimension	Rotational speed	Applied pressure	Pressing time
30 in. x 17.1	1900 rpm	130 ton	7 ~ 10 seconds

The result of the above has a weld chamfer 3 formed in the short pipe 1 section, and welding was performed as shown in Fig. 1 (D) by welding material similar to short pipe 1, and this welding was easily and accurately performed using standard methods.

Furthermore, corrosion tests were performed on the joint region of the results from the friction welding 2 described above. In other words, the test piece was a four-point curved sample, and the shape of the test pieces was as shown in Fig. 3, with the friction weld 2 area at the center, the thickness was 1.5 ± 0.1 mm, and the width was 10 mm. Samples were taken from the inside of the clad steel pipe, and the corrosive liquid used on these samples was a 95°C 5% sodium chloride solution with partial pressures of 0.02 atm for PH2S and 0.98 atm for PCO_2. In other words, the test samples were immersed for two weeks in this solution, the load stress was 60% of SMYS (27.4 kg/mm2), and test samples were simultaneously tested, but in the corrosion resistance test results using the four-point bend, no sign of cracking was observed.

EFFECT OF THE INVENTION

With the present invention as described above, dilution variation was eliminated for the composition of the cladding material or the like which had excellent corrosion resistance properties for circumferential welding of this type of clad steel pipe, and even if there was misalignment, that effect was eliminated in order to obtain an appropriately formed circumferential weld which maintains stable characteristics, and the industrial effects of this invention are major.

4. BRIEF DESCRIPTION OF THE DRAWINGS

The drawings show the technical details of the present invention, and Fig. 1 is an explanatory

drawing which shows the steps of the method of the present invention, Fig. 2 is a side view explanatory drawing for the friction weld method, Fig. 3 is an explanatory drawing for the test piece which relates to the weld example of the present invention, Fig. 4 is a perspective view drawing of a circumferential butt weld using current methods, Fig. 5 is a cross-section explanatory drawing of the weld layers and the chamfer shape of the weld region, and Fig. 6 is a cross-section image showing one example of a misalignment.

In these drawings, 1 is a solid stainless steel short pipe, 2 is a friction weld, 3 is a chamfer, 4 is the weld metal, 10 is the clad steel pipe, 10a is the cladding material, and 10b is the carbon steel base material.

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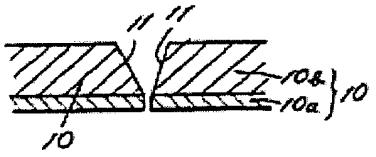
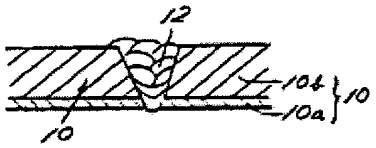
第 4 図

第 5 図





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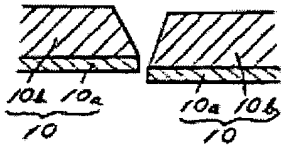

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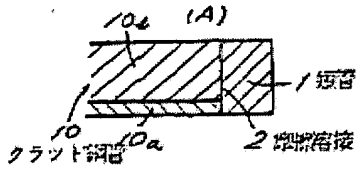

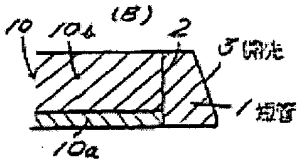

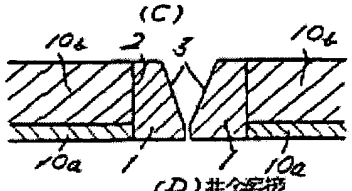

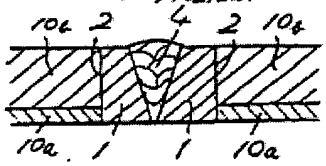

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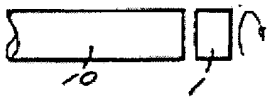

第 3 図